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Effects of secondary electrons on properties of a Hall thruster DMYTRO SYDORENKO, ANDREI SMOLYAKOV, University of Saskatchewan, Saskatoon, SK, Canada, IGOR KAGANOVICH, YEVGENY RAITSES, Princeton Plasma Physics Laboratory, Princeton, NJ, USA — Thermalization of cold secondary electrons in Hall thrusters (HT), if it occurs, limits the HT electron temperature. Plane geometry particle-in-cell simulations resolving the radial direction in HT reveal that almost all electrons emitted from one wall of coaxial HT channel reach the opposite wall without thermalization. The reasons for high penetration of emitted current are the low collision frequency and the depleted non-Maxwellian electron velocity distribution function preventing the two-stream instability. With 100% penetration, the secondary electron emission (SEE) does not affect the electron temperature in HT, which qualitatively agrees with experiments. However, the role of SEE in HT cannot be neglected. Secondary electrons acquire energy in crossed electric and magnetic fields and produce intense energy flux to the walls. These electrons increase the axial electron mobility in HT via the near-wall conductivity effect. Oscillation of kinetic energy of secondary electrons along their trajectories may impose a certain condition on the plasma potential.

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